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REPLY
TO
MR. SWINYARD'S REPORTS
ON THE
PRINCE EDWARD ISLAND RAILWAY,
BY
JOHN EDWARD BOYD,
Chief Engineer.

Printed by Order of the Government of Prince
Edward Island.



CHARLOTTETOWN :
J. H. FLETCHER, PRINTER, QUEEN STREET.
1875:

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Chief Engineer



CHARLOTTETOWN

1911

OTTAWA, 19th April, 1875.

The Honorable

The President of the Executive Council,
Prince Edward Island.

SIR:—

I have the honor to submit the following explanatory remarks on Mr. Swinyard's "Report on the Prince Edward Island Railway" addressed to the Hon. the Minister of Public Works of Canada, and referred to me by your letter of 18th April, 1875.

Although there are some points in the Report of 25th June, 1874, which it may be necessary for me to notice, it must be remembered that, at that time "the work had not been finally examined by the Engineer, nor had it been regarded by him as finished." I had been frequently over the work that season, was perfectly aware of its "exact condition," and had never represented it, officially or unofficially, to any one, as ready for final inspection, nor had any one connected with the work, so far as I am aware, claimed that any part of it was completed according to contract. The division between Charlottetown and Summerside was, nevertheless, in a much better condition than were most of the lines in New Brunswick or Nova Scotia when first opened for traffic.

LOCATION.

In order to place the whole subject in a proper light, it is necessary to give a short sketch of the proceedings from the inception of the works.

The Act, 34 Vic. Cap 4, authorizing the construction of the Trunk Line between Cascumpec and Georgetown, was passed in April 1871.

I was appointed Chief Engineer on the 1st May 1871, and arrived in Charlottetown on the 10th of that month.

I found the Government anxious to have actual operations commenced that season; I informed them that I could not undertake to make surveys, locate the line, furnish quantities of work, drawings of structures, &c., in time to meet their wishes in this respect. After some deliberation they decided to put the line under contract as soon as possible, without waiting for surveys, or giving any information to Contractors, further than could be afforded by a specification of the works, and a rough definition of the route which the line was to follow. The General Specification was made as full as possible as a guard against extra claims, and the control of the location kept, as much as it could be, under that mode of letting, in the hands of the Government.

In June two parties of Engineers were sent out to make preliminary surveys, so as to ascertain whether the routes desired by the Government were practicable, as well as to enable comparisons to be made, where opinions differed, as to the best route, but no attempt at a final location was made at this time or prior to the letting of the contract.

Tenders were advertised for on 23rd May, and on the 11th September, 1871, the contract for the Trunk Line was signed.

The Railway Act states that the length of line to be constructed would be "about 120 miles." How this was arrived at does not appear, but air lines joining the several objective points, afterwards named in the orders in Council, would make the whole distance 130 miles.

I had no means of knowing this at the time the General Specification was written, but supposed the distance given in the Act to be correct, and inserted it merely as an intimation to Contractors of the probable extent of the works.

The specification states that "the general route of the Railway will be defined by the Commissioners, and the Contractors will be required to locate the line as nearly on that route as the nature of the country will permit." Grading was not to be commenced until the Contractor had received notice in writing from the Engineer that the location had been approved by the Lieutenant Governor in Council.

As soon as possible I submitted for the consideration of the Government several routes surveyed under their orders and practicable within the limitation of the Act, which expressly provides that "no contract shall be entered into for the construction of the said Railroad, conditioned on the payment of any greater sum than £5000 currency (\$16,222) per mile for

the whole distance, including all surveys, and locating the line and all suitable Stations, Station houses, Sidings, Turntables, Rolling Stock, Fences, and all the necessary appliances suitable for a first class Railroad, and the construction of suitable wharves at Cascumpec, Summerside, Charlottetown and Georgetown." After due consideration, the Government selected the route which they deemed best, and it was formally defined by orders in Council, October 5th and 9th, and November 22nd, 1871.

The location made on this route by the Contractors was submitted to and approved by the Lieutenant Governor in Council, after correction, where practicable, by the Chief Engineer.

The *contract* length of the line is not, therefore, 120 miles, but the length of the line located by the Contractors in accordance with the terms of the Specification on the route defined by the Government.

Considerable discussion having arisen over this and other matters, and a change of Government having taken place, Messrs. Newton and Mechan, Civil Engineers, of New York, were employed to make an examination of, and report on the Railway. These gentlemen arrived in Charlottetown on 8th July, 1872, and went over the whole Road, accompanied by several members of the Government. They made a thorough examination of the line with the plans and profiles in their hands, and had trial lines and levels run at any points where they thought there was a chance of improving the location. Their report on this subject is as follows:—

"Under this head are embraced the most prominent points in our instructions, namely: the curves, and the question respecting the length of the line as laid out, compared with the length it was thought in the beginning would be required to traverse the distance between Alberton and Georgetown."

"This Act among other things, directs that the total cost of the Railway, including Rolling Stock, Stations, &c., in fact every thing needed to operate the road, shall not exceed £5000 currency per mile. With the view, also, of keeping the cost within this limit, so it appears to us, the Act further directs that the gauge shall be 3 feet 6 inches."

"His Honor the Lieutenant Governor in Council ordered the Gov. Chief Engineer to make the preliminary survey, and directed him, at the same time, to run the line so that it

would pass through certain points between the termini, Alberton and Georgetown."

In view of these instructions, and with the Railway Act before him, we are of opinion, that it was the duty of the Chief Engineer to stake out a line running through the points named by the Government on which the proposed Railway could be constructed, if possible, at a cost per mile, within the limit fixed by law. To have commenced surveying operations on a basis other than this, to have chosen a line on which perhaps a more direct road, but at a cost exceeding the legal limit might be built, would not have been in accordance with the intentions of the Government, when the orders in Council above mentioned were handed to the Chief Engineer. To have kept this important provision of the law out of sight, would have caused the survey to be practically valueless, as no contract conditioned for a greater price than this limit could be legally entered into.

In other words, *we think it was the duty of the Engineer to locate a railway that could be constructed for £5000 currency per mile, or failing in this, to state that this could not be done.*"

"This examination of the location of the Line, was made not with the view of pointing out a new general location, but to see whether the line ought to have been placed differently, within a reasonable limit of the general location. It is proper, however, we should state, that from our observations of the character of the country, no evidence was brought to light which leads us to believe that a new survey could materially improve the present general location of the line; keeping in sight the fact, that there are many places through which it is imperative the railway should pass, so that it might be of the greatest utility to the country. The tables presented, in our opinion, show that *while it was possible to have so run the Railway, that its total length between the termini, would have been, say in the neighborhood of five miles less than it is, yet that this could not have been done, without increasing the cost per mile to a sum greater than the limit fixed by the Railway Act.*"

"We believe that the Government Chief Engineer has confined the contractor within reasonable limits. We have given much thought to this subject, and have endeavored to keep constantly in view the relative positions of the Government, the Government Engineer, and the Contractor. To repeat in part what has been before stated, the Government—in our opinion—really directed its Engineer, to so locate the line, that the proposed railway could be constructed for the amount fixed by law; if he had done otherwise his work would have been useless, the intentions of the Government and of the law would

have been made nugatory. The contractor, we suppose, endeavored to secure a location as advantageous as would be allowed, but we do not think the Government Engineer has permitted a location which conflicts with his duty."

"Our attention has been called to the fact that . . . the total length of the road between the termini, Alberton and Georgetown, is spoken of as "about 120 miles." We do not know on what data this distance was estimated; it seems clear, however, on an inspection of the map, that a line but 120 miles in length cannot be run between these places, intersecting the points the Government directed it should intersect, even if it was quite straight, without a curve, other than such as would be needed for changes of direction."

"This portion of the report appears to have been unsatisfactory to the Government, and on 14th October, 1872 a letter was "addressed to the Inspecting Engineers, requesting some further explanations." On November 9th, they reply as follows:—

"We beg to leave to say, that we fully appreciated the importance of this question of location—that it was the most prominent feature connected with the examination. Accordingly, we gave it great attention; and, as need scarcely be stated, devoted upwards of one half of our report to a statement respecting the alignment of the railway. In doing this, as you doubtless observed, the line was divided into some forty sections, and the more prominent points respecting each of these divisions, were mentioned."

The Report was accompanied by maps and particulars of the principal curves; indeed, of every one which had caused remark. Now the question is asked why is the total length of the railway more than 'about 120 miles?' To this interrogatory we beg leave to answer, that it is because it cannot be materially less than it is, and intersect the points named in the orders of the Government of Prince Edward Island to the Government Engineer, who had charge of locating the line; *neither do our observations point out to us that the main line could, under any circumstances, be much less in length than it is; certainly not, unless at a greater expenditure than that fixed by the Railway Act.*"

Regarding the construction and the mode of letting the contracts they say:—

"This method, as we stated while on the Island, places wide discretionary powers in the hands of the Government Engineer; and to speak with a frankness that the spirit of your letter

requires, we feel bound to say, that we know of nothing which impugns the professional conduct of this gentleman."

The location of the Branch Lines was made in 1872, previous to the letting of the contracts, by Engineers directly under my control, the general route being fixed by the Government. Mr. Cox, the Engineer in charge of those surveys, has had great experience in such work, and his ability in that branch of the profession is undoubted.

I considered it necessary, in order that the cost of the whole work might not exceed the limit fixed by the Statute to keep the quantities of earth down down to 8,000 cubic yards per mile, but Mr. Cox had instructions to spare no time or trouble to get the best line possible within these prescribed limits, and this I believe has been done. Yet, in gradients and curves "the utmost limits given in the first contract" were found necessary, and between Harmony and Souris had to be exceeded.

The Eastern Extension has been slightly reduced in length by the change of Station at Souris. The increase of two miles and a half in the length of the Western Extension, was caused by an entire change of route. The line on which the contract was based (order in Council 20th Dec., 1872,) ran within a short distance of the N. E. coast. Before any work had been done a change of Government took place, and the present route running more inland (order in Council 7th June, 1874) was adopted, the Contractors receiving the same rate per mile, but deducting \$11,586.75, the price of a bridge across the Kildare River and adding \$2,080 for extra clearing.

The whole Railway has been carefully rechaind, and a stake driven and marked at each mile. Mile posts are not included in the contracts.

Prince Edward Island, with the exception of the District west of Summerside, is not, by any means, an easy country in which to build a cheap line of Railway. There are no regular ranges of hills, but the surface is broken into wide, deep, and abrupt hollows by the numerous streams which, owing to the soft nature of the formation, have cut down almost to the sea level soon after leaving their sources.

In the 44 miles between Summerside and Royalty Junction, two summits, 301 and 307 feet above the sea respectively, have to be crossed. These summits are eight miles apart, and between them the line descends to within 65 feet of the sea level. Several minor summits between 160 and 190 feet

high, are encountered on this and the Eastern Division, while the line, in several places, falls to within a few feet of high water. In the first five miles out of Souris, the line rises 220 feet.

The frequent and abrupt changes in the natural surface necessitated constant curves and gradients, unless works were undertaken which would be considered exceptionally heavy on any line, and such as were quite out of the question under a limitation of \$16,222 per mile.

It will be seen by Mr. Swinyard's synopsis that after all 132 miles, or two thirds of the length, consists of straight lines. If a large proportion is on gradients, this was unavoidable except by increasing the quantities of work or lengthening the line. The legal limitation in cost per mile prevented the first, the total cost of the Railway would have been increased by the second alternative. The elevation of the Road bed above the natural surface, is, in my opinion, a point of sufficient importance to warrant an increase of gradient in special cases; this was kept in view, and has been effected; 140 miles of the line being on embankment and only 60 in cutting. It should also be borne in mind that this is a narrow gauge Railway, and that it is claimed by the advocates of that system that the small cost of construction is arrived at by adapting the alignment to the natural surface of the country, by the use of sharper and more frequent curves than are admissible, or at least expedient, on a broader gauge.

The limits adopted on other lines of the same class, have not been exceeded or even arrived at. The Australian Railways have curves of 330 feet radius and grades of 132 feet per mile; the Norwegian Railways, curves of 750 feet radius, and grades of 125 feet per mile; the Ontario Railways, curves of 400 feet radius, and grades of 105 feet per mile; and the South American Railways, curves of 187 and 235 feet radius, and grades of 169 feet per mile. Gradients of 70 and 75 feet per mile are not uncommon in the neighboring Provinces.

On the P. E. Island Railway, the steepest gradient is 66 feet per mile, with the exception of one near Souris of 74 feet per mile, and the radius of the sharpest curve 604 feet, with the exception of one curve of 300 feet radius at Harmony, and one of 573 feet radius near Charlottetown. The exceptional curve and gradient on the Eastern Extension are necessitated by the natural formation, and are unavoidable. The curve

near Charlottetown was put in to lessen the land damages which are paid by Government.

As regards the general route, Mr. Swinyard admits in his first Report, page 21, that "although the line is very circuitous, it is undoubtedly well laid out to serve the general interests of the country." With this I have nothing to do, but I maintain that the details of location are in accordance with the recognized principles of the narrow gauge system; any excessive application of those principles being forced on me by its being made imperative that the Railway should pass through certain fixed points. As regards safety, the Road has been run over by construction and other trains for nearly two years, at much higher rates of speed than the ordinary traffic will require, without any accident, which was attributable to either the alignment or construction. If the subject of location has been dwelt on at greater length than the remarks in Mr. Swinyard's Report may seem to warrant, it is because this has been made a constant ground of attack, not only by those who, knowing nothing of the features of the country, the restrictions of the Act, or the nature of the contracts, are totally unqualified to pass an opinion, but by those who have a full knowledge of the circumstances, and from whom, therefore, a more impartial judgment might be expected.

CLEARING.

I do not claim that the clearing is completed according to contract. I have constantly urged upon the Contractors the necessity of finishing this part of the work, and they have repeatedly promised that it should be done. They claim, however, that, owing to some failure on the part of the Government to put them in legal possession of the land the first season, they could not burn the brush as soon as it was cut, and that, after becoming soaked with water by lying on the ground, it would not burn.

This excuse I declined to admit, and I have stopped \$300 in the final settlement. As the rubbish is nearly all piled and ready for burning, I think this amount will be found sufficient to pay for the work. The greater part of the clearing is very well done. The cutting of standing timber outside the Railway fence was not included in the contract, but all trees which seemed in danger of falling were cut by my orders.

FENCING.

The contract for the trunk line provided for board fencing throughout. This was changed to wire fencing by order of Council, 12th December, 1871, on the ground that the latter was better adapted for Railway purposes, especially in a country where the snow drifts so much as in Prince Edward Island.

Mr. Swinyard has dealt so thoroughly, and, I may add, so fairly with the merits and defects of the Fence in his preliminary report, pages 18 to 21, that it is only necessary for me to explain a few points.

Although the posts were inspected and marked by inspectors appointed by the Government, and the Fence built under the supervision of men similarly appointed, much of the work is done in a very slovenly and inefficient manner. I voluntarily pointed this out to Mr. Swinyard, as he states at page 4 of his report, and told him of the difficulties that had arisen. His experiments were, I believe, the result of our conversation. I approved fully of his suggestion for the improvement of the fence, and would willingly have adopted it, but the contractors declined to do so, without extra remuneration, which it was not in my power to give. I was, therefore, obliged to fall back upon the next best method of having a post driven in the centre of each panel, wherever the small size of the original post enabled me to demand the improvement.

The fence was a source of great trouble from the beginning. No doubt, much of the prejudice against it arose from the way in which it was at first built, but this was much increased by other conditions quite distinct from the question of defects in the fence, which appeared to be regarded by many as a fair object for the exercise of their destructive propensities. The wire was continually stripped off, and carried away, or so twisted together that it could not be used again, and hundreds of the straining bolts and nuts were broken or removed. In accordance with my instructions, the fence was all repaired during last summer, but, in many cases, especially near road crossings, fencing, which had been put in good order, was found, twenty-four hours afterwards, completely wrecked with much of the material missing.

To meet these peculiar circumstances, I made the following agreement with the contractors:—"All return fences to

cattle guards and to station grounds, are to be of posts and battens. All gate posts at crossings are to be braced as per accompanying plan.

"Between Charlottetown and Summerside, the lacing must be as specified in order in Council of solid wire.

"On Eastern and Western Divisions it *may be* as follows :

'In clearings take off the bottom wire, and drive the stakes firmly. Remove the present half lacing, and use the lower wire, removed for making *two* complete lacings in each panel from top to bottom.

'In woods remove the lower wire, and drive the stakes firmly, and continue the half lacing to the top wire.' "

Under this agreement board fencing was substituted, without extra charge, at all the points most exposed to destruction, and the fence through clearings made more efficient by additional lacing.

The plan of gates referred to by Mr. Swinyard, page 19, and showing posts mortised into a cross sill, was originally intended for the board fence, but, when the wire fence was adopted, it was thought better to substitute to posts sunk $4\frac{1}{2}$ feet into the ground. There is nothing in the contract requiring the adoption of either plan.

The fencing and gates were put in good order before the completion of the contract, but it is quite likely, as Mr. Swinyard says, "the whole will require overhauling in the spring of the year."

This it will require every year, and the cost of doing it is chargeable to maintenance.

The contract for the Western Extension provided for board fencing, which has been built somewhat roughly, but in a substantial manner, and in compliance with the specification.

On the Eastern Extension the contract provided for wire fence in cleared lands, and board fence in the woods. Mr. Swinyard says the latter is "very satisfactorily done, and fully up to specification." It is quite probable that from causes mentioned above, some of the straining bolts are missing in the wire fence, but I believe it was built in such a manner as to meet the requirements of the specification.

GRADING.

Mr. Swinyard says, page 45, "The grading throughout, as far as the Road bed is concerned, has, as far as we could judge, been well done. The width at formation is generally up

to the specification, and the slopes properly formed, and, from the nature of the material, they will, no doubt, remain in good condition. The ditching and drainage of the Road has been, on the whole, carefully carried out, but the embankments, at some places in low lands, should, in our opinion, have been, at least, one foot higher, in order to have kept the Road bed well above any accumulation of water that may take place during the spring or very wet weather." The grading of the line was most carefully attended to. Gangs were put on to trim and finish in advance of the ballasting. The rounding up of the Road bed is a point to which I attach great importance, and I gave the matter my personal attention. The drainage was made as complete as possible; water was not allowed to lodge any where if it could be by any means drained off. There is no ground for apprehending any drainage from the accumulation of water in low lands. With the experience of two seasons as a guide, the embankments were raised wherever they appeared too low. The making up of embankments at the ends of bridges and over culverts, is very generally done in the later stages of the work, and additional filling is almost always required at such points, but this is surely part of the cost of maintenance.

The statement that "absolutely nothing has been done," in the grading of the station grounds, is an exaggeration. As much has been done as will answer for the present requirements of the line. I do not consider that I could, under the contract, compel the Contractors to grade the whole area taken, amounting, in some cases, to several acres.

Roads from the highways to the station grounds are not included in the contract, and, in some cases, the land for them was not appropriated, the Government intending to take it under the Highway, and not under the Railway, Act.

CULVERTS AND DRAINS.

Mr. Swinyard says page 46 "The culverts and drains (323 in number) throughout have been well and substantially constructed. The culverts, with five exceptions, which are of timber, have been built in masonry, with stone of large and good quality, and compare most favorably with culverts of a similar character on other Railways. We were not personally enabled to judge of their sufficiency in size for the passage of water during heavy freshets, but, from the care and attention bestowed, we believe sufficient water way has been given."

Messrs. Newton and Mechan, who examined the work while in progress, say, in their Report, page 25, "the character of the masonry is very good * * * The masonry in the abutments in process of construction was well executed; it is evident those in charge were taking pains to do good work. * * * The drainage of the Road appears to have been carefully considered; we think it will be found to be ample."

Wherever it appeared from observations made during the progress of the works, and extending over three years, that the original water ways were insufficient, they were enlarged or additional culverts were built.

BRIDGING.

Mr. Swinyard says, "The general character of the bridges is good, having stone 'foundations' and abutments with timber 'superstructures.' There are forty-six bridges of spans ranging from 20 up to 100 feet, of which latter there is now only one."

In order to make the structures as durable as possible, care was taken to keep all timber from contact with the earth. Where trestles are used, they stand on stone piers, and the ends of the stringers rest on masonry built on piles driven into the embankments.

I think Mr. Swizyard over-rates the objections to the situation of Midgell Bridge, the location of which is unavoidable, as can be seen on the ground. The construction trains have been run over it, without accident, during the past season, in every possible way, and at high rates of speed. It will be quite unnecessary "for safety to bring the trains to a stand before passing on to this structure in either direction."

It would be more correct to say that the bridges are "near to" than "at" the foot of gradients, a position they necessarily occupy in spanning streams which run in valleys. The Bridge is either on the grade or on a "piece of level." Two descending gradients never meet on a bridge. Speaking from memory, for I have now no plans in my possession, only six out of the forty-six bridges are on curves and this will hardly warrant the assertion that "in many cases bridges are placed on curves."

PUBLIC CROSSINGS.

The public crossings, all of which are provided with cattle

guards, and which average one at every mile and two-thirds in the length of the line, are, as Mr. Swinyard agrees, "all fairly up to specification."

PRIVATE OR FARM CROSSINGS.

The law enables land owners to demand one private crossing on every farm, and two on farms exceeding thirty chains in width. The consequence is that no less than 759 private crossings or nearly four to the mile were required. Mr. Swinyard is right in supposing that they "will be a source of much inconvenience and expense," especially if stringent rules, obliging proprietors to keep the gates shut, are not enacted and strictly enforced. Under the provisions of the law the number could not be lessened.

SLEEPERS OR TIES.

As regards the size of the sleepers, I had, long prior to Mr. Swinyard's first visit, drawn Mr. Gregory's attention, both verbally and by letter, to their deficiency in this respect. I pointed them out to Mr. Swinyard myself, and informed him of my intention to have the matter put right, before the line was taken off the contractors' hands. Owing to disputes about the Government inspection, the nature of which I reported to you in my letter of 6th October last, there was some difficulty in getting the contractors to carry out my orders, but in the end most of the small sleepers were removed or supplemented by an extra number. To cover any remaining deficiency, I required the contractors to deliver 1690 additional sleepers, and have deducted \$400.00 from the final estimate to cover the cost of putting them into the track.

In respect to the number per mile, I must re-iterate the statement already made, that, when I wrote the specification for the trunk line, I intended the number "about 2500" to include an allowance for sidings. To cover the want of full information and to avoid any chance of extra claims, I deemed it prudent to make all allowances as full as possible. The clause was so explained to parties who asked for information and thoroughly understood. The drawing of the track showing 2200 ties to the mile, was subsequently prepared in my office, and sent to the contractors, and that number was used as the basis of the schedule quantity. I never had any intention of requiring 2500 ties per mile in the main line.

In the specification for the Branch Lines, a drawing pre-

viously prepared was referred to, and the number 2200 per mile shown by that drawing, was therefore given. About this there could be no misunderstanding.

The cases are quite dissimilar, and will not bear the analogy Mr. Swinyard seeks to establish between them. Apart from the fair presumption that I know the meaning, I intended the disputed clause to convey, the contract makes my decision final "on all questions in dispute with regard to the meaning or interpretation of plans and specifications." I do not admit any deficiency in the number of sleepers, beyond that provided for by the stoppage in the final estimate.

BALLASTING.

Mr. Swinyard says, page 49, "While we found that the quality of the ballast used was fairly up to specification, it was my duty to report that the result of the tests we made showed a considerable deficiency in quantity, particularly between Hunter River and the Western terminus of the line, Tignish, a distance of $96\frac{1}{2}$ miles. From the notes taken at each mile, we estimate that the deficiency will not be less than 30,000 cubic yards which, at the prices fixed in the schedule, would amount to a loss in value of about \$15,000." The drawings of the track show the centre depth of the ballast to be 12 inches, the rounding of the grading bringing up the average cross section depth to 15 inches, which, with an average width of 9 feet (8 feet top and 10 feet bottom) gives the contract quantity of 2200 cubic yards per mile. Over $96\frac{1}{2}$ miles, Mr. Swinyard makes a mean centre depth of $10\frac{1}{2}$ inches, which would give an average depth of $13\frac{1}{2}$ inches. By Mr. Swinyard's own measurement the average width of the ballast on this part of the line is $9\frac{1}{2}$ feet, instead of 9 feet, and this, multiplied by $13\frac{1}{2}$ inches, will give 2090 cubic yards per mile, or a total deficiency of 10,587 cubic yards, instead of 30,000, and the value of which at the schedule prices, would be less than \$5,000, instead of "about \$15,000." Three quarters of an inch in depth would make up this deficiency, and I do not believe that, with the best intentions, the depths could be measured as closely as that. In many cases, the ballast differs but little in appearance from the material in the cutting or embankment. In others, in order to save the best ballast as much as possible for the top lift I had a shallow bottom lift of somewhat inferior material run on.

I offered these facts in explanation, but as Mr. Ridout declined to receive them, I did not press the matter, feeling confident that the contract quantity of ballast had been put on the line. The pit measurements show a large excess, and though part of this may have been used to "make up" embankments the margin is still ample. On the remaining distance of 102 miles, Mr. Swinyard's measurements would show an excess of about 36,000 cubic yards over the contract quantity. This, to my mind, only proves how impossible it was for him to arrive at a correct estimate of the quantity actually on the line.

RAILS, &c.

The contractors were furnished with a specification for the manufacture and testing of the rails, fish plates, bolts and spikes. The rails were inspected by Mr. Henry Gaerth, C.E., of London, and stamped on the ends with his brand, each cargo being also accompanied by his certificate. The spikes were made chiefly in New Brunswick and Nova Scotia.

Mr. Swinyard speaks favorably of the iron in both Reports.

The Rails have been carefully straightened wherever they had been bent during construction, and the alignment has been made true on both curves and tangents.

STATION BUILDINGS.

In his Report of 25th June, page 24, Mr. Swinyard, after describing the station houses, says: "It will be observed that a very considerable reduction of buildings has been made at all places except Charlottetown; that dwelling rooms at every station have been cut out; and that at Charlottetown smaller offices have been provided in lieu of the roomy offices originally designed. The changes so made were under an agreement between the Government and the Contractors, the reason given being to provide for the more expensive diversion of the line through the town of Summerside, which was recommended by the New York Engineers, and also to provide for covered sheds at all terminal stations in which to receive the passenger trains. I regard this alteration as a mistake."

In his second Report, page 49, he says: "This departure from the original designs, made by order of the Provincial

Government, will now involve an expenditure of about \$4,500."

As I have previously explained, there was no time given, before the letting of the contract for the trunk line, to prepare plans of any kind. I was, therefore, obliged, in order to give parties tendering some idea of the work required, as well as to bind Contractors to some efficient designs to specify approximately the dimensions and description of the station buildings I intended to erect. The contract provided that the plans should be furnished as the work progressed; as soon as possible after the letting of the contract the plans were prepared. They were nearly completed in accordance with the description given in the specification, and tracings of many of them had been sent to the Contractors. It appears that, about this time, (February 1872) the Government were pressed to provide covered Stations at the principal towns, and after some negotiation, the Contractors were requested to state on what terms they would make the proposed change in the buildings.

On 13th March, 1872, I received a roll of plans, accompanied by the following order:—

"The Lieutenant Governor in Council has referred to you for your Report, with such suggestions as you may think proper to make all the plans submitted by the Railway Contractors, with a view of supplying covered sheds at the Stations in Charlottetown, Summerside, Alberton and Georgetown, in the stead of those provided for in the contract between the Government of this Island and Mr. Schreiber, the Contractor."

I accordingly made such alterations in, and additions to, the plans as seemed absolutely necessary, and the designs, thus amended, were approved by the Lieutenant Governor in Council, April 9th, 1872, and were regarded thenceforth as the contract plans.

They were submitted to the Consulting Engineers in July 1872, and, by them, approved as "adequate for the business of the Road."

Without giving any opinion in the matter, I submit that I cannot be held accountable, in any way, for the change in design which has caused the deficiency in living room and office accommodation, of which Mr. Swinyard complains. The alteration was made contrary to my expressed wishes, and

solely to meet the views of the Government with respect to the covered Stations.

The question of the diversion of the line at Summerside was not connected with the change in the buildings, and did not come up until some months afterwards.

The Station houses on the branch lines are built in accordance with the contract plans, which are copies of those adopted by the Government for the trunk line.

Mr. Swinyard says, page 8, that "the sites of the way Stations have not, in all cases, been very judiciously selected, having regard to the easy stopping and starting of trains. Most of them are on inclines."

Messrs. Newton and Mechan say, page 29, of their Report, "Looking at the maps with reference to the population, and the number, and direction of the highways in the neighborhood of the general location of these Stations, they appear to us to be properly placed."

The Stations are necessarily situated near the points where the public roads cross the Railway, and though some of them are not perhaps in desirable positions with respect to the gradients, I do not see how they could well be differently located.

They are more numerous than on most Railways, being 64 in number, or at the rate of one every three miles.

The sites of the principal stations demand particular notice.

With Tignish, I believe, no fault can be found: the station yard is large and well arranged.

Alberton station was located first by the Pope-Government in 1871, changed, in 1872, by the Haythorne-Government, on the recommendation of Messrs. Newton and Mechan, and, finally removed to its present site, near the junction of the Tignish branch, on the change of Government in 1873. There is ample room in the station yard for all time to come.

When the extension to Tignish was decided on, Alberton was no longer a terminal station, and the engine and car sheds provided for in the contract became unnecessary. At my request the contractors erected instead six extra tanks and tank houses at different points on the line.

The station at Summerside was located in 1871, by the Pope-Government. The site chosen was nearly a mile back

from the water front, and was connected with the wharf by a branch. In 1872 the matter was referred, by the Haythorne Government, to the Consulting Engineers.

They say "dispensing with the branch at this place, running the road along the water front, on or about the preliminary line staked out while we were on the Island, with the main depot near the railroad wharf, would be a better location than the present one for the business of the town, and the community generally. In considering this suggestion it is expected that the additional cost will be duly considered and balanced with the advantages that may be anticipated from the change."

By order in Council, 2nd August 1872, I was "directed to proceed to Summerside and make an exact survey and estimate of the cost of the route leading to the Railway wharf at that place, also of the part of the shore required for the station as recommended by Messrs. Newton and Meehan, and to report in detail to the Lieutenant Governor in Council, specifying the kinds and quantities of materials required, their value and the cost of labor."

The contractors claimed \$60,000 extra as compensation for work done on the first location, and for additional work on the new line, but finally consented to take \$40,000, the amount of my estimate of the difference in cost.

Mr. Swinyard, speaking of this new line, says, page 5 of his report: "A worse location it could hardly be possible to conceive," and proceeds to give, at some length, his reasons for holding that opinion.

In May 1873, a "petition from the inhabitants of Summerside, praying for the removal of the Railway Station," to a third site at the back of the town was referred to me by the Government. I accordingly made a survey and estimate of the cost of a line through the proposed site. This line is shown on the plan referred to by Mr. Swinyard, page 6. This plan, with a few additions to fit it for his use, is a copy of one submitted by me to the Government, 21st May 1873. As the work on the shore line was, by that time, far advanced, it was decided to let the station remain where it now is.

Mr. Swinyard says, "The station yard is much too limited and insufficient for the requirements of the traffic."

The land for the station was taken and laid off by the Com-

missioners. I remonstrated at the time, pointing out the insufficiency of the area, and recommending the purchase of the corner lot referred to by Mr. Swinyard. It was, with some difficulty that the engine and car sheds were fitted on to the ground taken, as their position proves. The enormous damages awarded for all property in this neighborhood had, no doubt, great weight in limiting the quantity appropriated.

The station at Charlottetown was located in accordance with an order from the Commissioners, dated 18th March, 1872. The convenience of the site for business purposes is indisputable, and, if my design for the extension of the yard were carried out, the whole arrangement would be extremely commodious.

Much of the ground which now forms the station yard is "made land." The contractors remonstrated very strongly against the site as an expensive one for them and considerable discussion ensued. An agreement was finally come to and all the work included in the contract under that agreement has been performed.

I always contemplated extending the area of the yard as an extra work, and prepared a plan showing my design, a copy of which I gave Mr. Swinyard on his first visit to the works. This extension has nothing to do with the contract.

In the spring of 1872, I was sent to Georgetown to try and arrive at some understanding as to the most convenient site for the station. I was directed to call on the leading men of the place, and ascertain their views on the subject. This I did, and the result of the matter was that the public square, which is Government property, was selected as the site. The inconvenience of having to detach the engine before running the train into the passenger station I foresaw, but after all this will not be a very great matter at a station, where the arrivals will not exceed two trains a day. It can be avoided, if necessary, by extending the track across the street, the property on the east side of which also belongs to the Government. The passenger house could not be moved back or west, as suggested by Mr. Swinyard, without being thrown on to a curve.

But, while disapproving of the present arrangements, Mr. Swinyard admits that the necessity for any change "is likely to arise only in the far future." The room at the west end of the station is a mere baggage room, about 16 feet square, and

was not designed for a freight room. The line first located ran straight to the shore. Had this line been retained, the passenger station might have been near the wharf, but it would have been immediately at the foot of a steep gradient.

On account of the high land to the north of the town, Souris is difficult of approach. The station was originally located on the upland in the village of East Souris, but subsequently changed to the beach in both cases by order of the Government. It is quite possible that the whole plan may be found to require rearrangement, when the site of the breakwater is determined. The present location, which carries the Railway to the only harbor that now exists, is probably as good as any that could be made for the time. In his preliminary report, page 35, Mr. Swinyard says:—"There is one matter of great importance which requires immediate consideration, namely, the necessity there is for establishing repair shops at Charlottetown, no provision for which has been made, I beg to submit a plan prepared by Mr. Boyd showing the accommodation required."

I am fully alive to the importance of providing well furnished repair shops, but as they were not mentioned in the Act, it appeared they could not be included in the contracts. I kept the matter constantly in view, however, and had drawings of the shops prepared, and estimates made of the cost of the buildings and tools.

In June 1873, I brought the subject to the notice of the Government by letter, and submitted a plan showing the shops, and an extension of the station yard at Charlottetown. This plan was also laid before the Minister of Public Works in October 1873, and led to an order to build the breastwork between the Ferry and Railway wharves, as an extra work. No further steps were, however, taken in the matter. I gave Mr. Swinyard copies of these plans and estimates on his first visit to the Island.

This matter is not, in any way, connected with the contract, and I refer to it merely because Mr. Swinyard has done so, and to show that the absence of repair shops is not due to any neglect or want of forethought on my part.

SIDINGS.

The total length of sidings to be laid was specified to be equal to about one tenth of the length of the main line.

This was intended as a maximum limit, and not as an absolute condition, and was so explained before the letting of the contracts. I anticipated a demand for a large number of sidings, and retained power to put in as many as were necessary.

At the Way Stations there are 17 through sidings, 14 of which will hold 16 cars each, or two ordinary trains, and three of which will hold eight cars each. Several of these have a blind siding which will hold two or three cars in addition. There are also 47 spur sidings at Flag Stations, each capable of holding four freight cars. This is at the rate of one siding for every three miles of the line. The average distance between the stations where trains can pass, is $9\frac{1}{2}$ miles.

In my opinion, this is a liberal allowance of siding accommodation, and quite as much as the country will require for several years to come.

Semaphore and lamp signals were not provided for by the contract; they belong to outfit rather than construction.

WHARVES.

At the time the contract for the trunk line was signed, even the sites of the wharves had not been determined. But, as it seemed desirable to give approximate lengths in the specification as a guide to parties tendering, I measured the wharves, then standing in the several harbors mentioned, allowing an additional length to carry the Railway wharf out to deep water.

I thought the allowance made would be ample, but the sites afterwards selected by the Government, were at some distance from the wharves on which I had based my estimate of length, and the length of wharfing built is nearly 950 feet in excess of that anticipated by the specification.

A claim for extra payment has been made by the contractors, disallowed by me, and referred, among other matters to arbitration.

Mr. Swinyard may be right in saying that "the wharf at Summerside is unnecessarily long, and too much exposed," but the 16 feet of water, required by the Government order, could not be reached with less length of wharf. The end was damaged by ice in the winter of 1873, but has since been

sheeted with close piling which, it is believed, will protect it for the future.

Dredging along the sides of the wharves was not provided for by the contract.

ROLLING STOCK.

The minor criticisms, in Mr. Stronach's Report on the Engines, I pass over as matters of opinion, on which mechanical Engineers may legitimately differ, and with which, I am not expected to deal.

The English Engines were built by well established firms and were favorably noticed by "Engineering."

The American Engines were built at the "Baldwin" Works in Philadelphia.

The principal fault found appears to be that six of the Tank Engines are too light for winter service. On a line which, during the summer, will have a large proportion of light traffic, these Engines will be very useful. The ordinary passenger trains connecting with the steamers will never consist of more than one postal, one second class, and baggage and two first class cars weighing say 50 tons, or less than two-thirds of the load the Engines have been working under. It would certainly not be good policy to run heavy Engines with such trains, and I maintain, therefore, that I have been guided by correct principles in providing the six light Engines.

The eight heavy Engines, which are as powerful as the gauge of the Road will admit, will be quite sufficient to work the winter traffic.

The contract provides that "The Contractors shall be allowed to use the Engines and cars for purposes of construction, and shall return them at the termination of the contract in perfect order and repair, failing which, such a sum shall be deducted from the amount of the contract as shall, in the opinion of the Engineer, be sufficient to pay for the necessary repairs."

By Mr. Swinyard's permission, I employed Mr. Stronach, the Mechanical Superintendent on his staff, to examine the Engines, and report to me what repairs were necessary under the above clause. He did so, and I forwarded a copy of his re-

port to the Contractors with instructions to act in accordance with it. When the Contractors reported to me that the Engines were ready for final inspection, I examined them in company with Mr. Stronach, and found that they had been repaired in accordance with his Report, except the turning of the tyres of the wheels of nine of the Engines. The Contractors having no wheel lathe could not do this, and I have, therefore, deducted from the final estimate \$450, the value placed on this work by Mr. Stronach. I do not know what else I could have done to protect the interests of the Government in this matter.

The repairs spoken of by Mr. Stronach, in his Report to Mr. Swinyard, January 11th, 1875, have been rendered necessary by damages received after the final inspection and acceptance of the Engines, and in traffic service, a matter which has no connection with the contract, and over which I have no control.

PASSENGER SERVICE CARS.

There were no contract plans in the ordinary sense of either Engines or cars. The drawings for the latter were furnished during the progress of the work.

The outfit, mentioned in Mr. Stronach's preliminary Report, is not part of the construction, and not included in the contract.

Check chains were not provided for by the contract, and were not put on. It was only last year that the Master Car Builders Association in the United States decided, after a long debate, in favor of check chains. Many of the members of that Association held them to be useless or even mischievous.

The wheels at first adopted for these cars were 24 inches in diameter, which was four inches more than the diameter of the wheels then in use on the American Narrow Gauge Railway. They were found to jar a good deal in passing the frogs, and the Contractors consented to replace them with 28 inch wheels, without extra charge. These have been found to work satisfactorily.

FREIGHT CARS, &c.

Mr. Swinyard attaches great importance to the fact of the Box Cars being boarded horizontally instead of vertically:

The drawing at first prepared shows vertical boarding. Mr. Hunter, the Contractors' Master Car Builder, who has been engaged for ten years to my knowledge, and probably longer, in building and repairing cars, suggested the change to horizontal boarding. As his reasons seemed to me to be sound, and the cost was the same, I sanctioned the alteration, as I had a perfect right to do under the contract.

The matter is not one of very great importance one way or the other, and its being so prominently brought forward is perhaps a proof of how little there really is with which fault can be found.

The Platform Cars are built according to contract. Any damages received by the cars during construction, were made good before they were taken off the Contractor's hands.

I visited the shops frequently while the work was in progress, and believe that all the cars were well and faithfully built.

When the snow ploughs were taken off the Contractors' hands by me, they were new and in good order. For damages received afterwards in the attempts to open the Road for traffic, I am not accountable.

Opinions differ so widely as to the proper form for snow ploughs, that I am not surprised to find Mr. Stronach suggesting an alteration in the shape. Whether it will be an improvement or not, remains to be seen.

Mr. Stronach's plan of inserting a rubber spring in the bar connecting the legs of the flanger, is, I have no doubt, a very good one.

There is, apparently, some desire to ascribe the failure to open the Road last winter to imperfections in the Engines and snow ploughs.

From all I can learn, the machinery was not handled in the most judicious manner, but apart from this, the line had not the ordinary protection of snow fences, and the unusual depth of the snow, which was far in excess of that known for many years, probably rendered the opening of the Railway virtually impracticable under the circumstances.

GENERAL REMARKS.

As regards the Trunk Line, it must be remembered that no plans of any kind were prepared before the signing of the

contract. There are, therefore, no "contract plans" within the ordinary meaning of the term.

The Specification provided that plans should be furnished from time to time, during the progress of the work, and these could be altered in detail by the Chief Engineer as he thought proper.

Any Engineer will understand that as the works proceeded and the plans were drawn, various deviations from the dimensions given in the General Specification would suggest themselves as necessary or expedient.

The slight reduction in the sizes of the cars referred to, and explained at page 28 of Mr. Swinyard's Report, and the increase in the diameter of the wheels, are cases in point.

On the Branch Lines there were contract plans, and these have not been deviated from except by the enlargement of some of the water ways and the change in the design of Morell Bridge.

In order to avoid heavy damages, the fixed truss of 100 feet span at first proposed, was altered to a telescope bridge, giving an opening of 40 feet for the passage of vessels. For this change, which was forced upon the Government by the exorbitant demands of the owners of the riparian lands, the Contractors were paid \$22,000.

It might be inferred, from some remarks in Mr. Swinyard's second Report, that I had purposely withheld from him plans and other information with which he should have been furnished.

The plans of the Station buildings have been in his hands since June last. Besides these there were very few plans of the structures on the Trunk Line in my possession, for the following reasons given in my letter of November 9th.

The engineering of the Trunk Line was by the terms of the contract placed in the hands of the Contractors. Their Engineer, therefore, submitted the plans of Structures, &c., as they were required, and I returned them marked "approved," or with orders for alterations, as the case might be. The originals were consequently in the possession of the Contractors.

The structures, with a few exceptions, were small and unimportant, and the plans were general drawings which were modified by the Assistants to suit particular localities.

I entirely disclaim all intention of concealing anything from Mr. Swinyard. I never disputed his right to make, nor did

I ever throw any obstacles in the way of his making such examinations as he thought proper. I spoke to him freely about the works, showing him plans and explaining any departures from the original designs. The whole tenor of his first Report, which is based to a large extent on information given by me, proves the truth of this statement.

To such plans as I had, he was offered free access, but I had no time to furnish him with copies, and the proper place for the original's was in the Railway Offices until the completion of the contract.

I cannot admit any claim on Mr. Swinyard's part to control the details of construction, nor could I, without involving the Government in litigation, permit him to interfere with the Contractors, even had I been so inclined.

The contract provides that the Chief Engineer shall be the "sole judge of work and material, in respect to both quantity and quality, and his decision on all questions in dispute with regard to the works and materials, or to the meaning or interpretation of plans and specifications, or to points not provided for, or not sufficiently explained in the plans or specifications, is to be considered final."

Mr. Swinyard has no right to submit an estimate of the cost of making the works meet his views and then claim that they have fallen so far short of the requirements of the contract.

My estimate of deficiencies is as follows:—

Clearing and Burning,	\$300 00
Ties or Sleepers,	400 00
Repairs to Engines,	450 00
	\$1150 00

And this sum has been deducted from the amount c. the contract in the final settlement. Discussion between Mr. Swinyard and me was useless, as such explanations as I did offer were not accepted, and apparently not believed.

I do not feel that after eighteen years of uninterrupted practice, I am open to the charges of "lack of judgment and want of Railway experience."

In cases where my judgment was free, I do not fear an impartial examination of my work.

I hold that the Reports of Messrs. Newton and Mechan, and, to a great extent, those of Mr. Swinyard himself, will

bear me out in the assertion that, in adaptation to the wants of the country—in mechanical works—and in general construction, the Prince Edward Island Railway will compare favorably with more costly lines in the neighbouring Provinces.

I cannot be held responsible in cases where my opinion was not taken, or in which my judgment was fettered by orders which I was bound to obey.

I have purposely refrained, as far as possible, from expressing an opinion on such matters, as I do not feel called upon to discuss the policy of my official superiors.

The inspection of the Line was not made in the inefficient manner to be inferred from Mr. Swinyard's letter of December 2nd.

At the beginning of July last, I directed Mr. Cox, my principal Assistant, to walk over the whole line and report to me on its condition. He was occupied constantly until the middle of October in this duty. Copies of his Reports were sent as received to the Contractors, with orders to make good any deficiencies therein noted. With these Reports in my hand, besides frequent visits to special points, I went over the whole line several times. The consequence was that, by the time my final inspection was made, the points which it was necessary to examine, were reduced to a very small number. On the trip referred to by Mr. Swinyard, we stopped at and examined every Bridge and Station House on the line. I frequently asked Mr. Swinyard whether they were any other places at which he desired to stop, and whenever he expressed such a wish, it was attended to.

He, having previously made such a detailed Examination as he deemed proper, had also, I presumed, noted any points which in his opinion, required attention. I did not go over the Georgetown section because, on my last visit, I had found that all my instructions had been carried out. If my course, in declining to permit Mr. Swinyard to assume complete control of the works, and to determine when and how I should perform my duties, did become "unsatisfactory and painful" to him, I have at least the satisfaction of knowing that it met

with the approval of the Government, to whom alone I was responsible.

I have the honor to be, Sir,

Your obedient servant,

(Signed,)

JOHN EDWARD BOYD.

(Certified)

WILLIAM C. DESBRISAY,

Asst. Clerk Ex. Council.

